# Level 3 Revisited: Monthly Means, Climatologies, and AIRS L3 Lite

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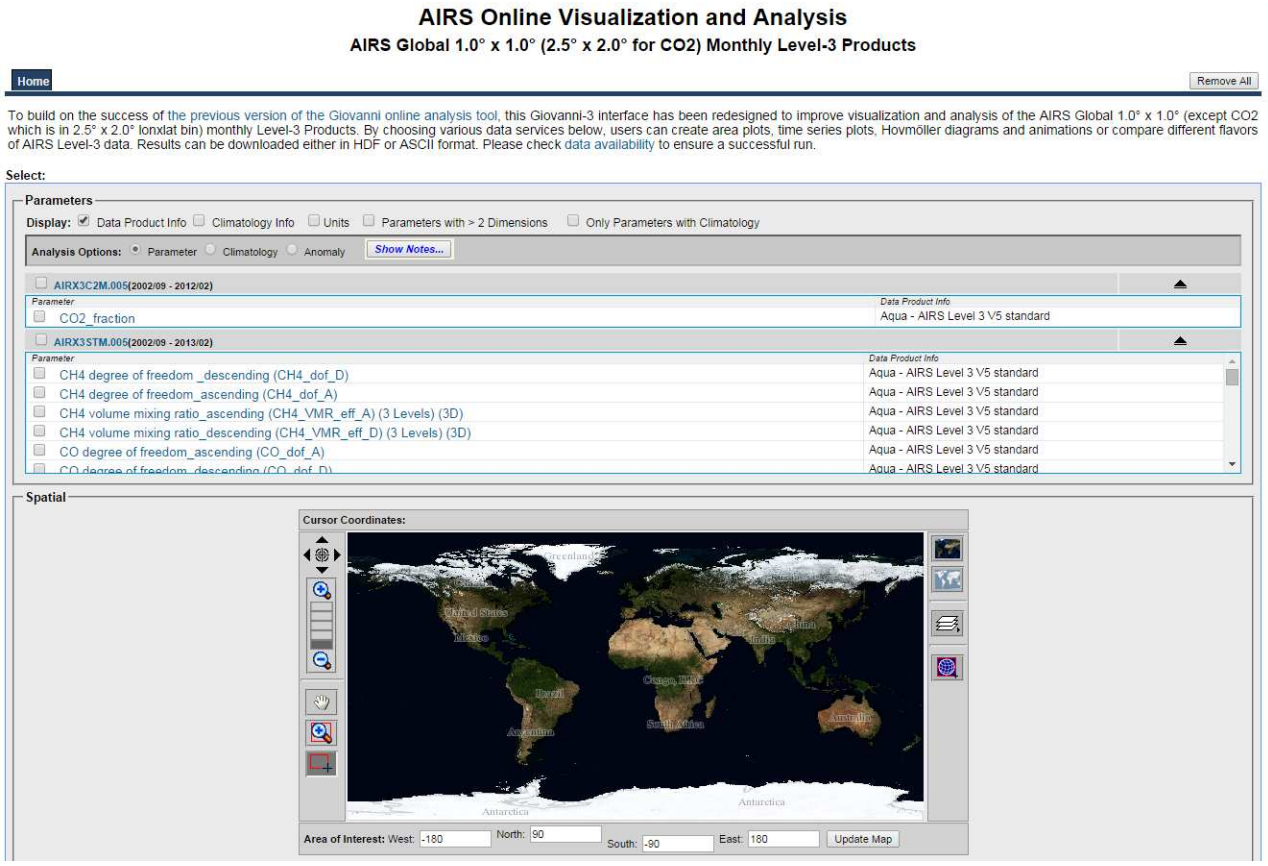
# Outline

- Update to Giovanni: G4 vs. G3
- Climatology product
- Level 3 Sampling
- Level 3 Lite: smaller files, faster downloads

# Update to Giovanni

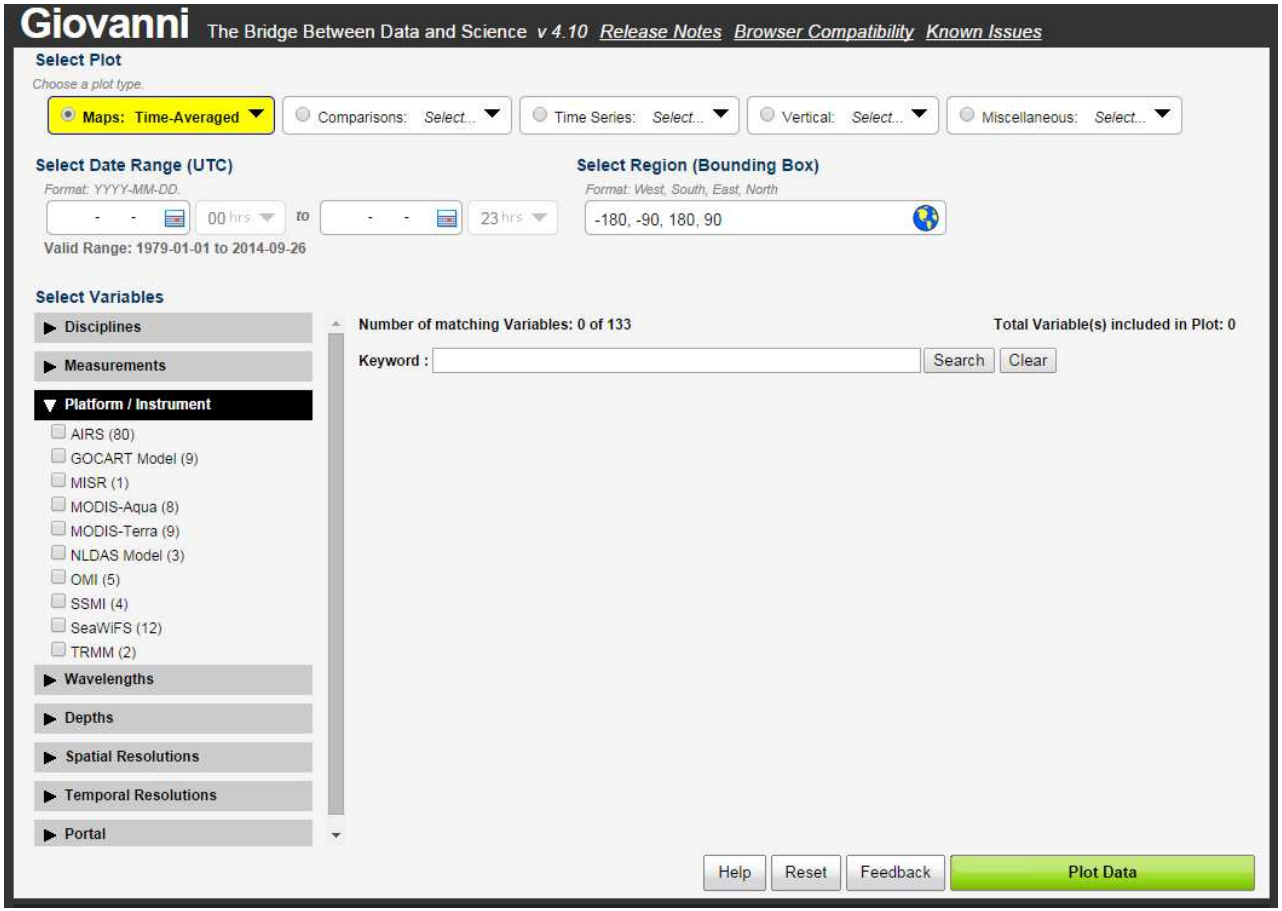
- Giovanni-3
  - Provides AIRS Version 5 data
  - Unofficial AIRS climatology is used to calculate anomalies
- Giovanni-4 (aka “G-4,” “agile Giovanni,” “AG”)
  - Provides AIRS Version 6 data
  - faster
  - new features
  - Currently No Climatology, thus no anomalies

# Giovanni-3




- Provides AIRS Version 5 data
- Unofficial AIRS climatology is used to calculate anomalies

# Giovanni-4




- Provides AIRS Version 6 data
- faster
- new features
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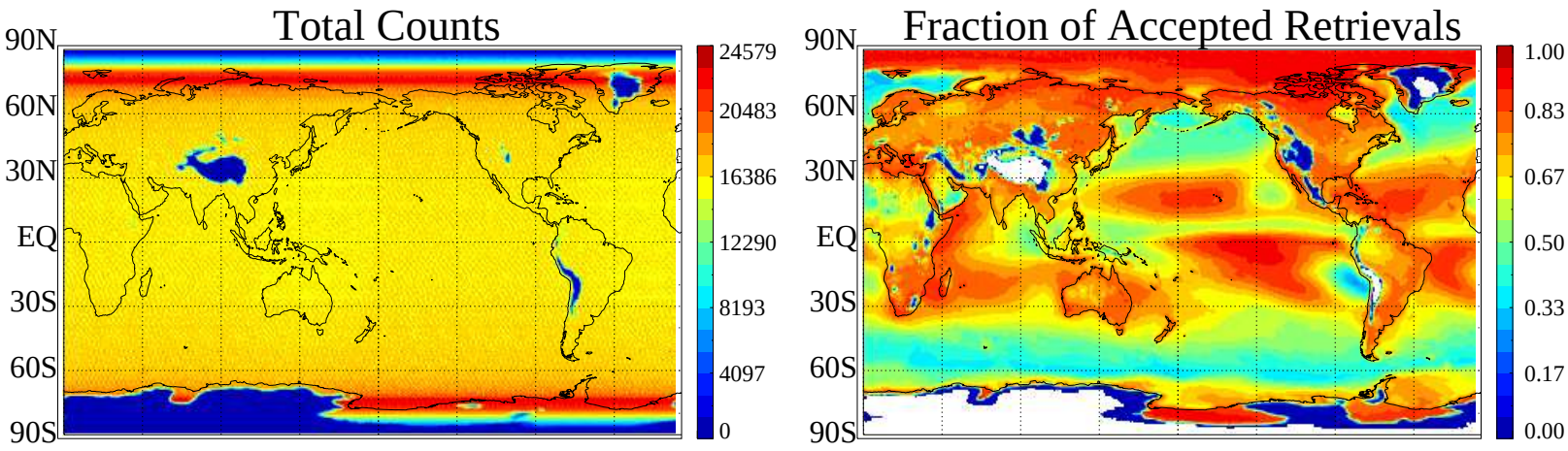
# AIRS Climatology

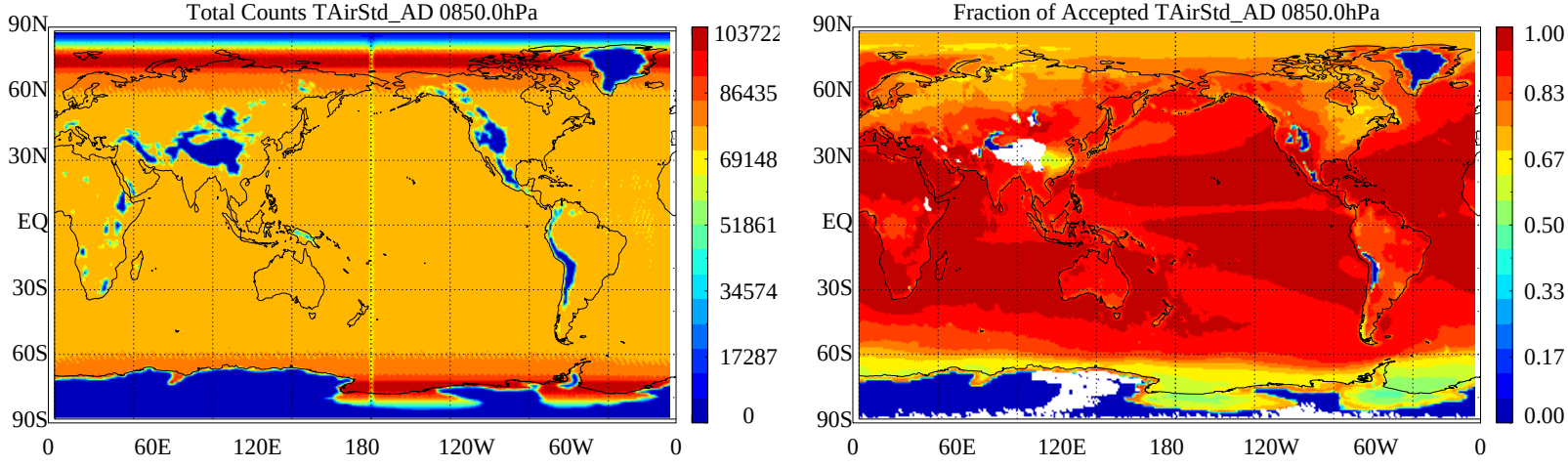
- Giovanni-3 used a climatology created offline from AIRS Version 5 Monthly Mean data.
- At the last science team meeting we proposed using the Level 3 PGE to create a monthly climatology product that would average over all Januaries, Februaries, etc.
- Problem: The Level 3 code calculates a weighted mean for each grid cell based on the number of counts. An arithmetic mean may reduce the sampling bias for multiday products.
- Giovanni-4 will probably get another unofficial climatology created from AIRS Version 6 data.
- Version 6 has improved sampling but we can still make improvements in the Level 3.

# Increased Yield in version 6

## Version 5

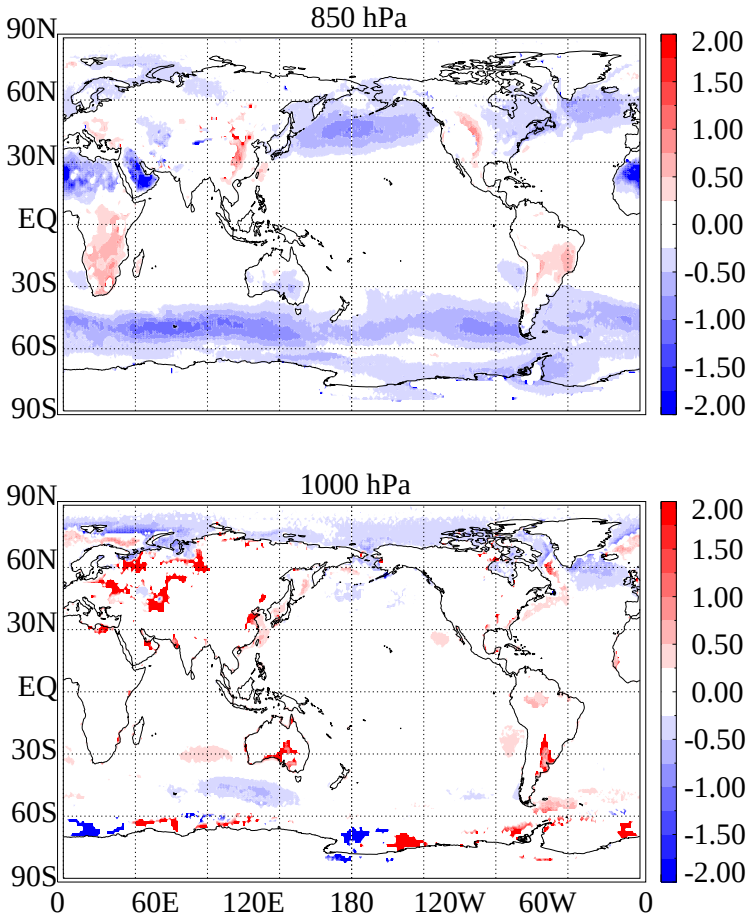



## Version 6



# Sampling Bias Estimate

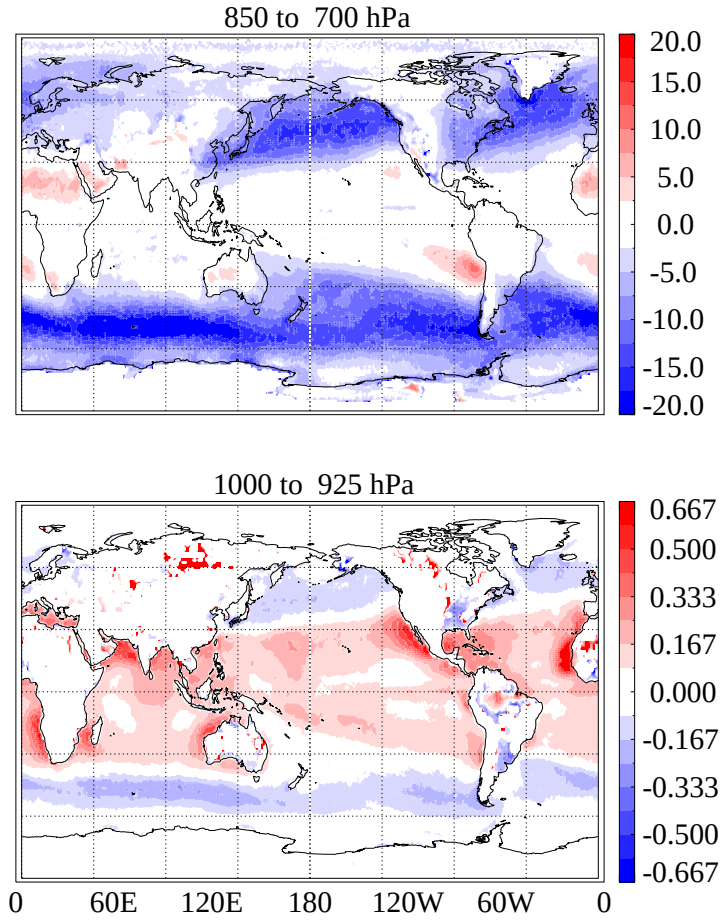
Temperature







Water Vapor



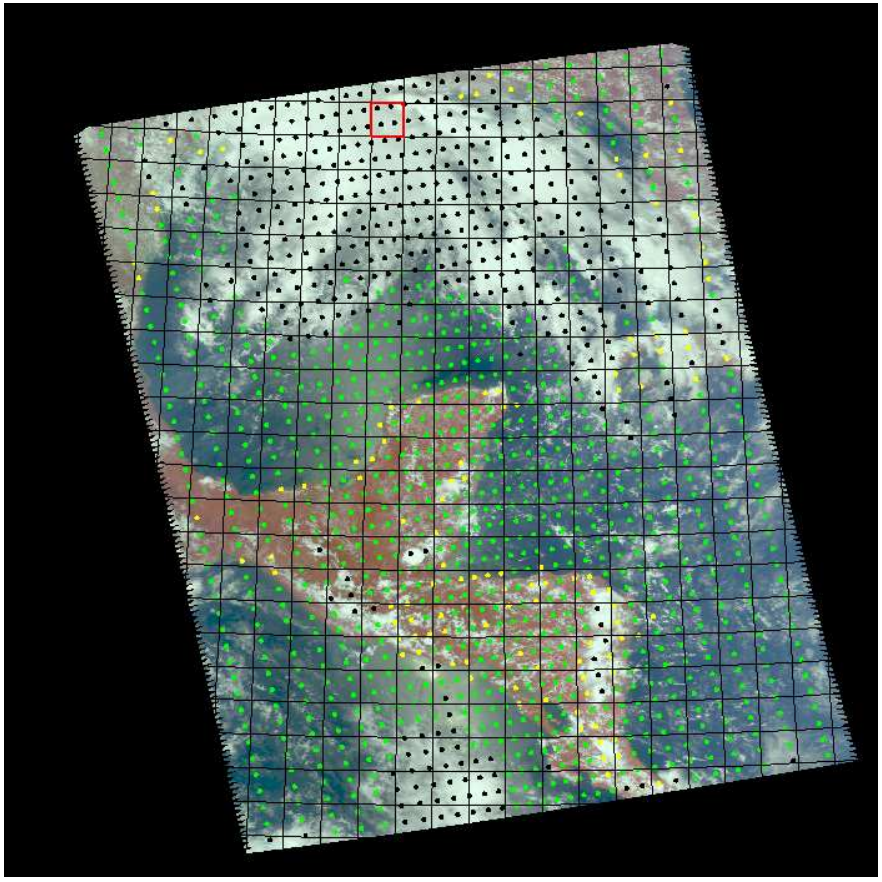




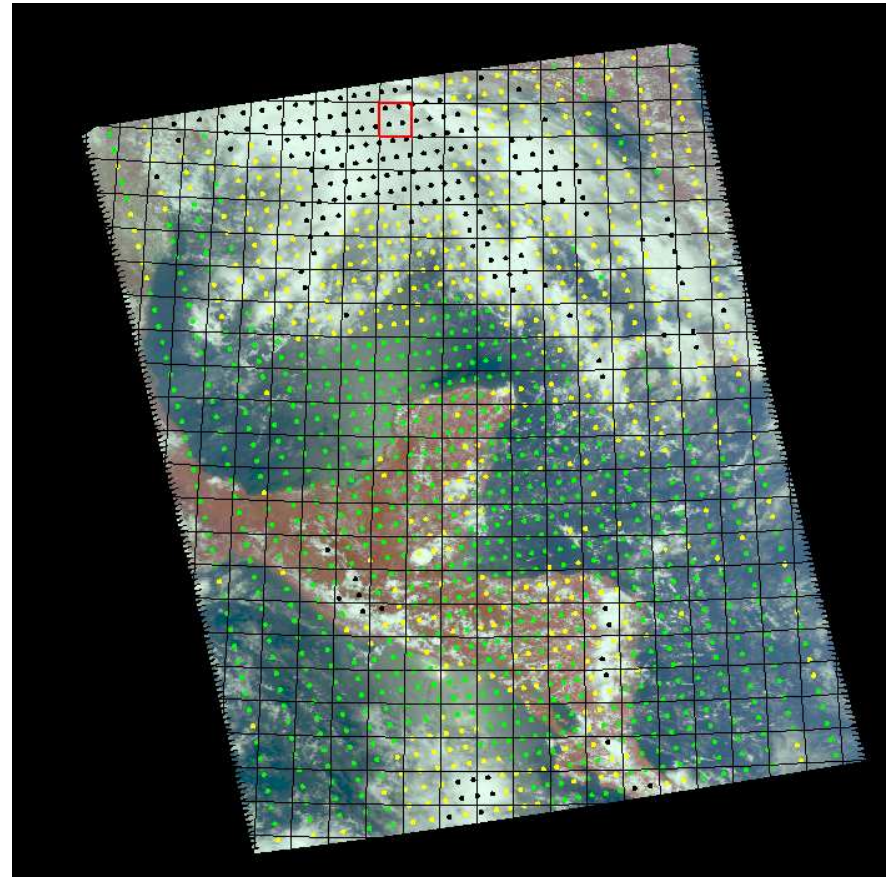
Using Version 5 quality control applied to MERRA data we found a warm bias in the boundary layer (Hearty et al. 2014). Other regions may have cold, dry, or wet biases. Version 6 sampling bias will be significantly less.

# Increased Yield of Level 2 data

Version 5



Version 6



The Version 6 algorithms has more successful retrievals in cloudy regions.

The dots show the quality for the Temperature retrieval at 850 hPa.

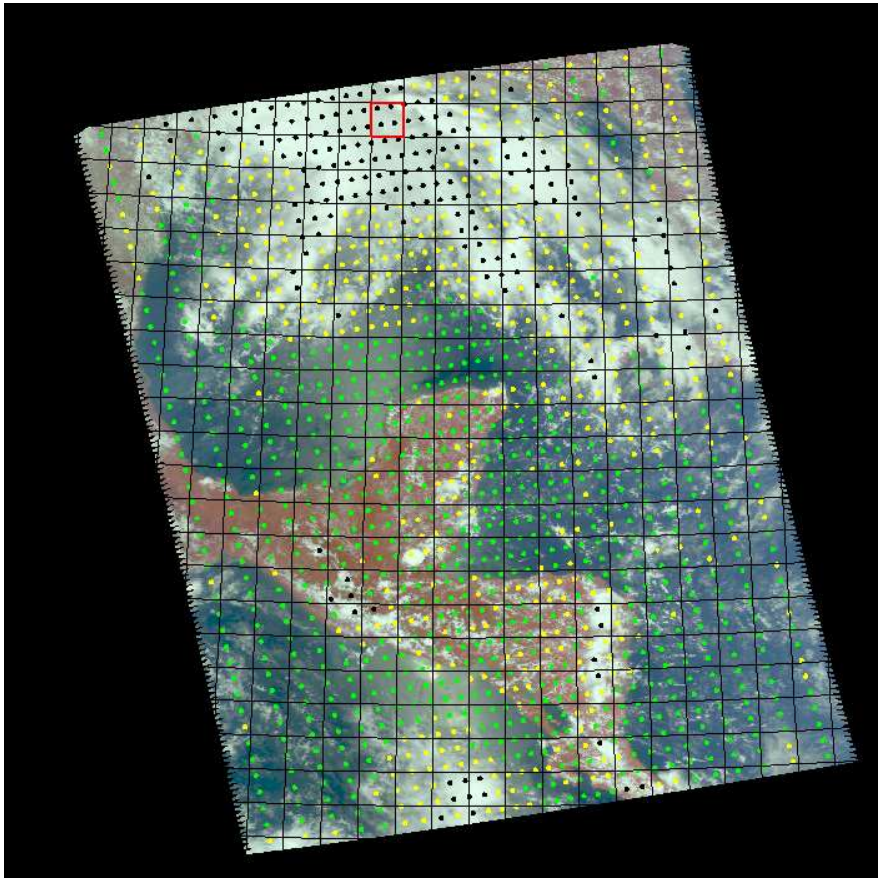
Green Quality = 0

Yellow Quality = 1

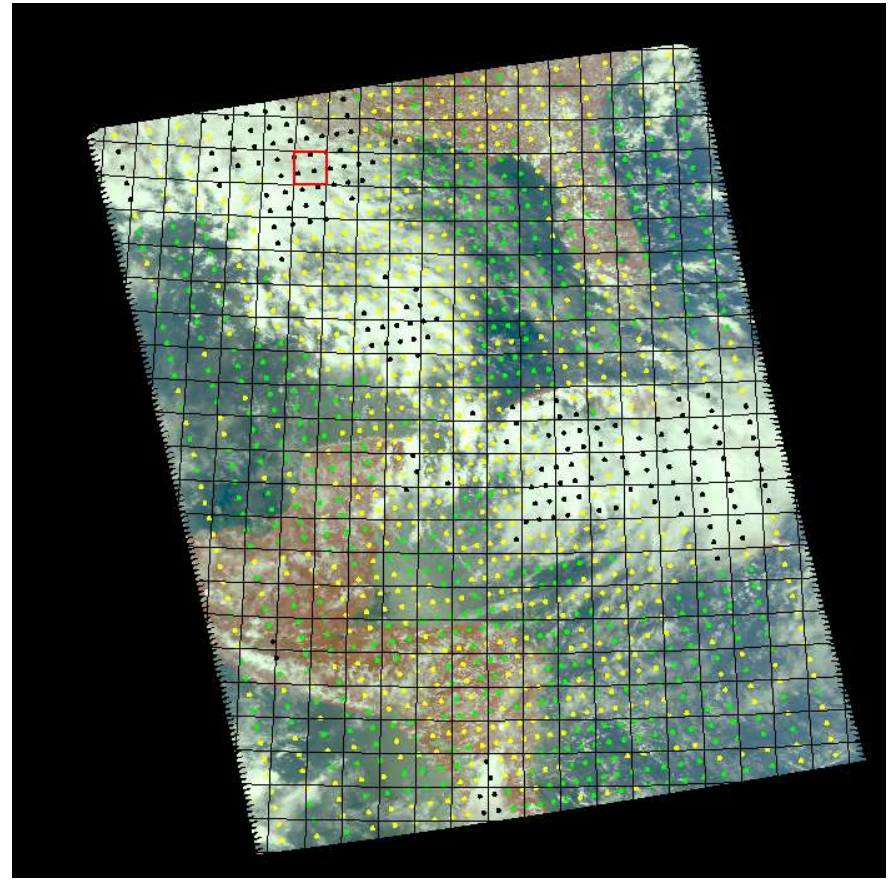
Black Quality = 2

# Version 6 Data

September 6, 2002



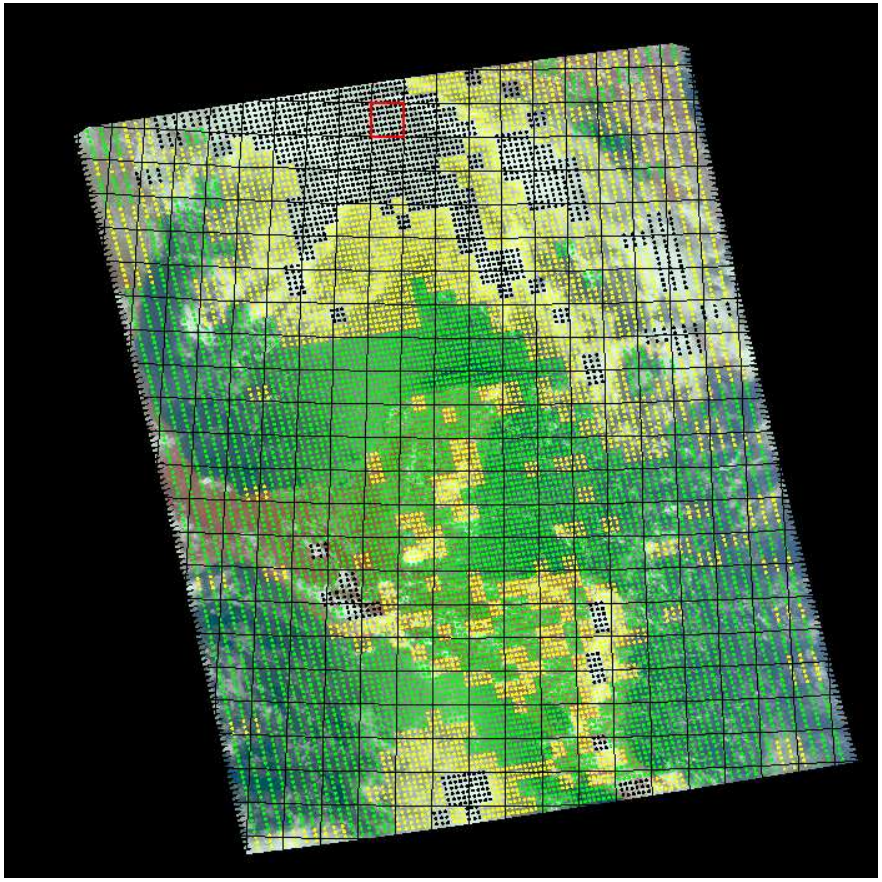
September 8, 2002



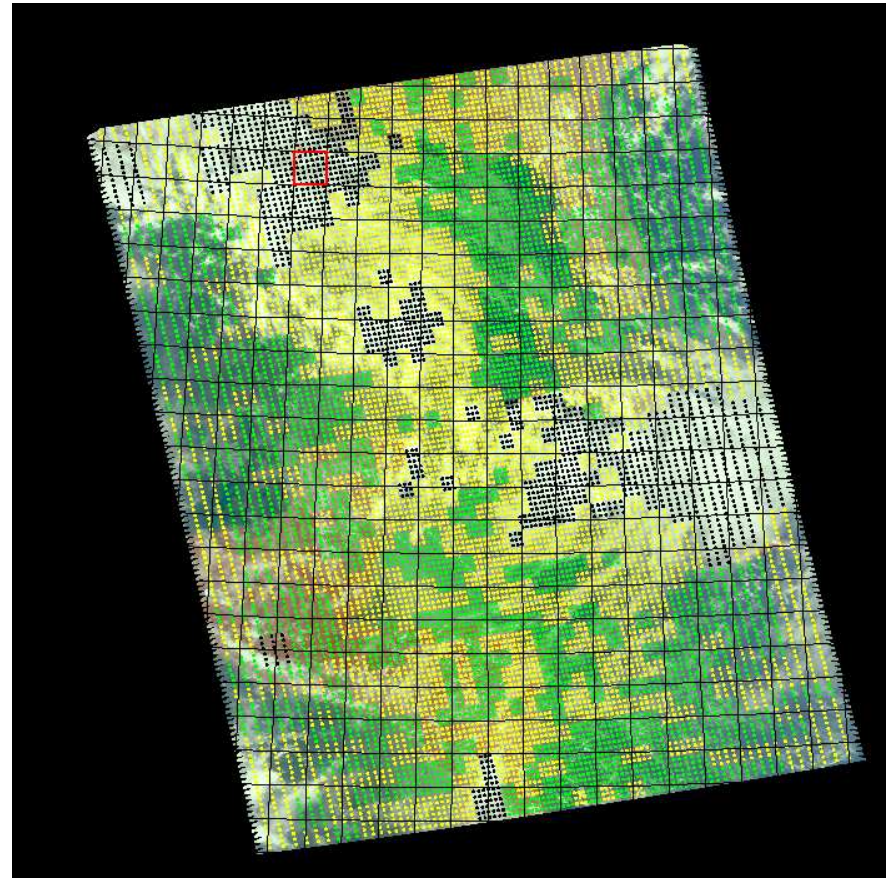
Still there are no successful retrievals over New Orleans (red square) on September 6, 2002 (or even 2 days later).

# Version 6 Data

September 6, 2002

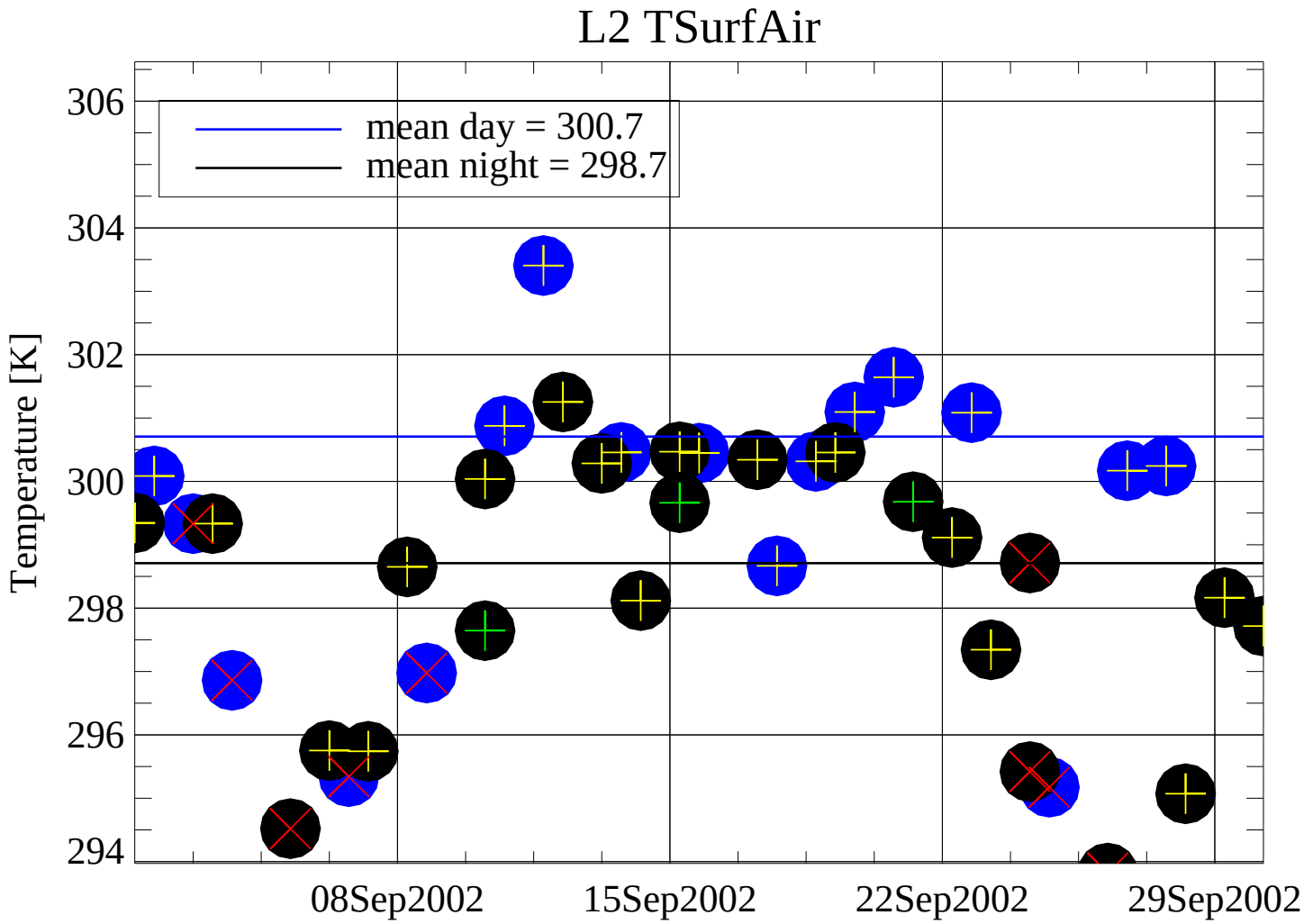


September 8, 2002



Even with the new gridding method that includes AIRS footprints overlapping with the grid cell there are no retrievals on these days.

# L2 TSurfAir over New Orleans

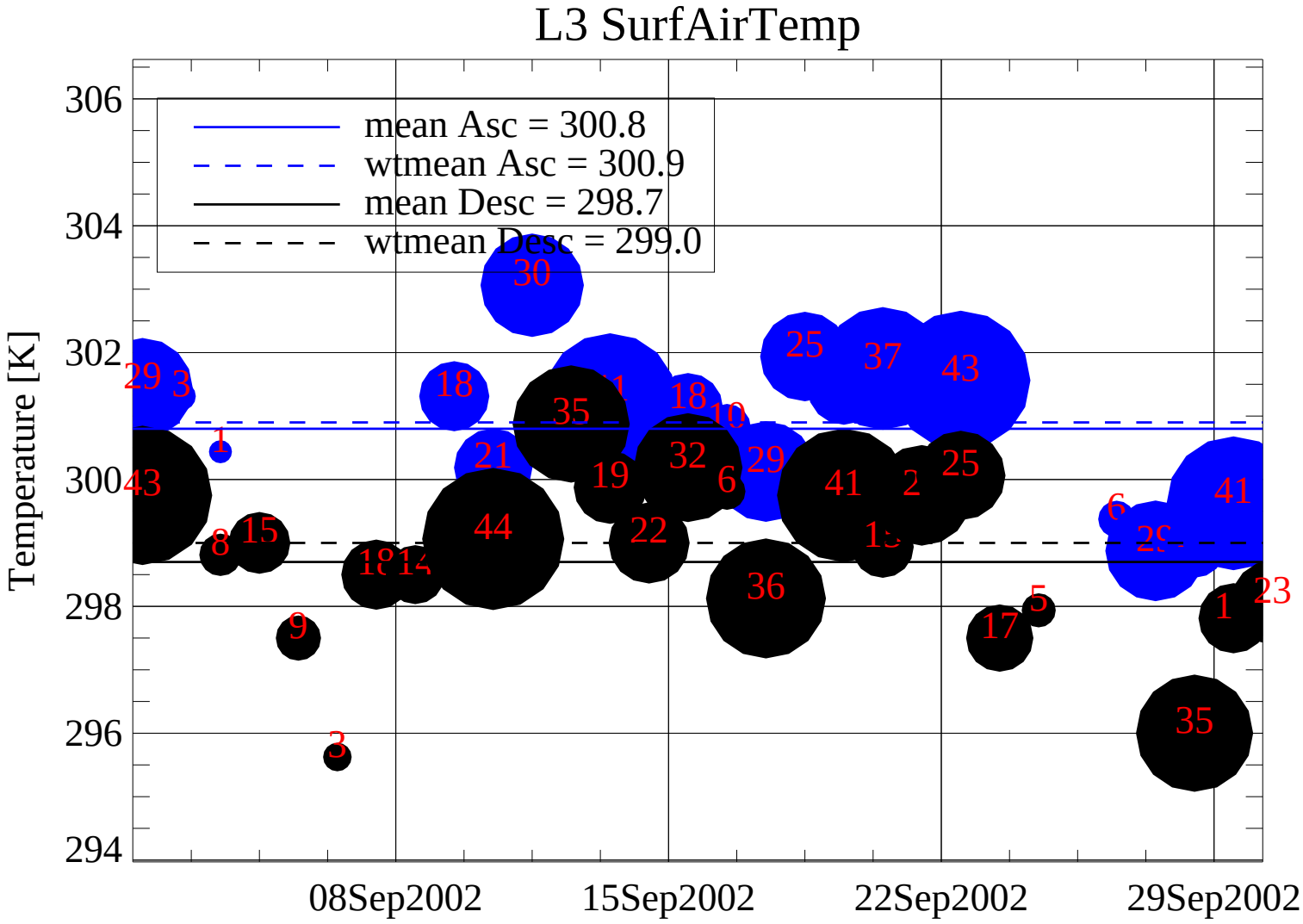



It is warmer in the day than at night. The daytime retrievals on September 6th and 8th are flagged as "Do not use." N.B. all of the rejected retrievals are $\leq$ the average of the valid data.

# Landsat image of New Orleans

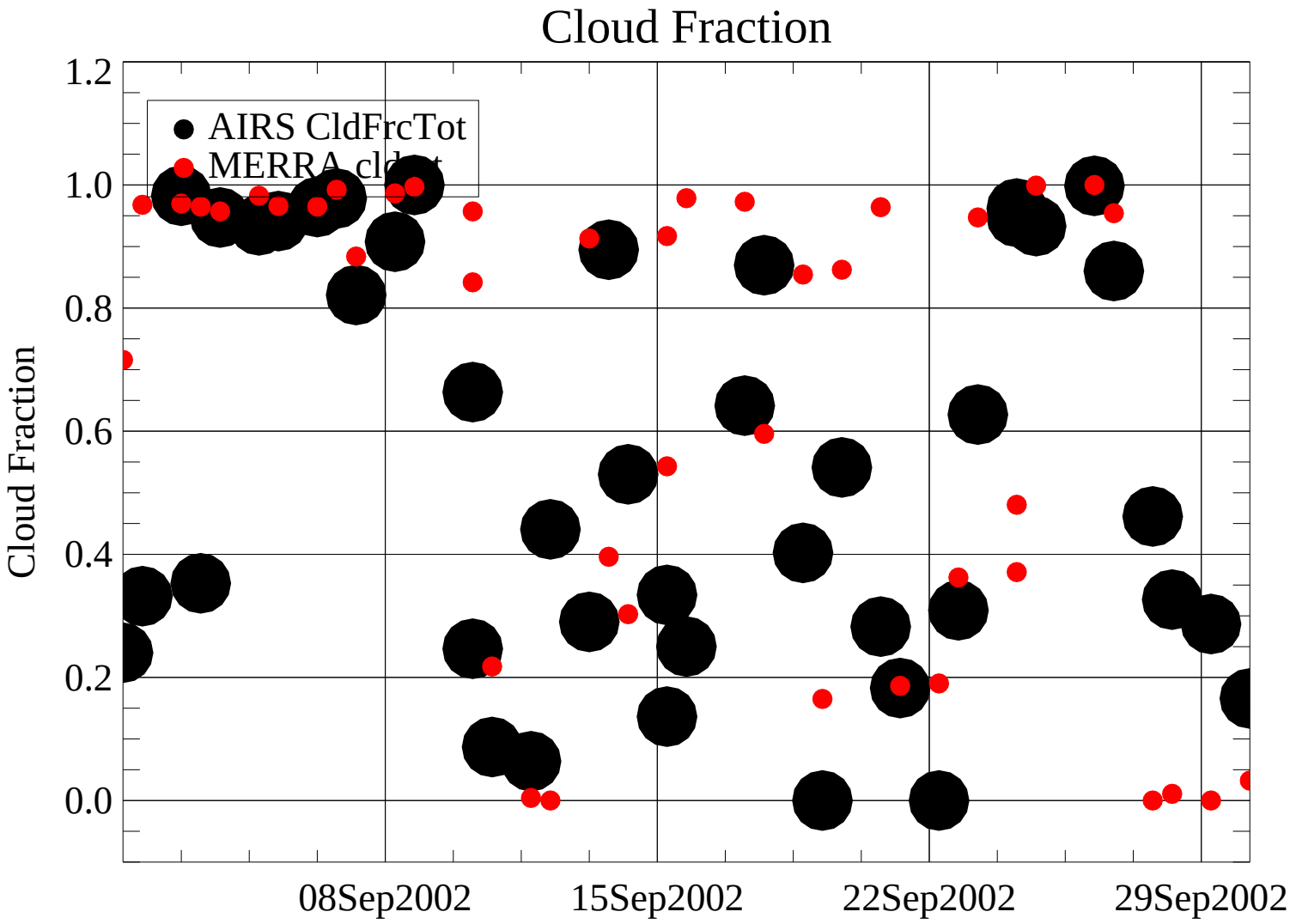

The bridge across lake Pontchartrain is $\sim$ 38.28 kilometers (23.79 mi).

# Level 3 Time Series



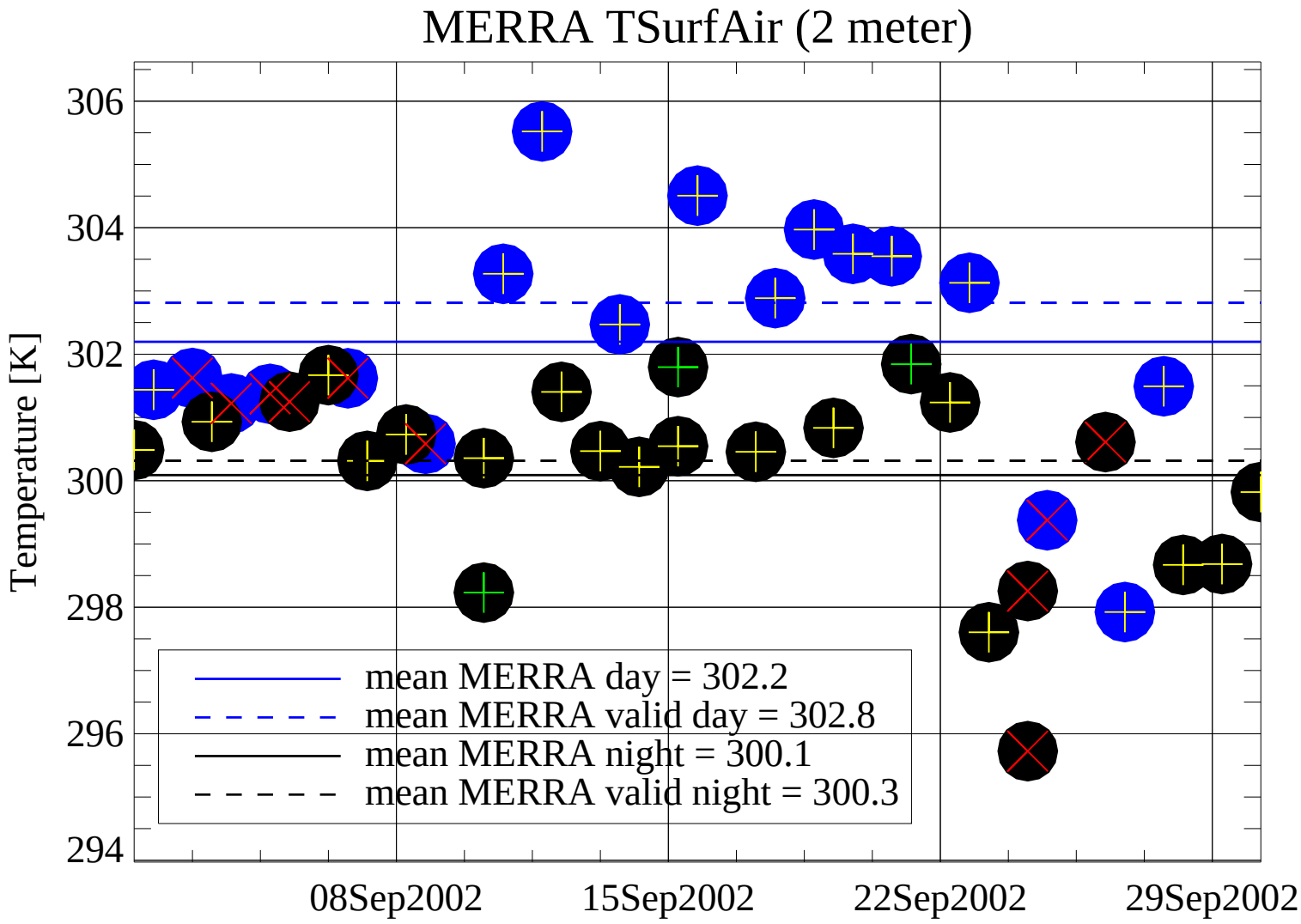

The difference between the weighted and unweighted means is $\sim$ 0.1 K for this case. Are the cold retrievals bad?

# AIRS and MERRA




AIRS and MERRA both agree those days were cloudy.

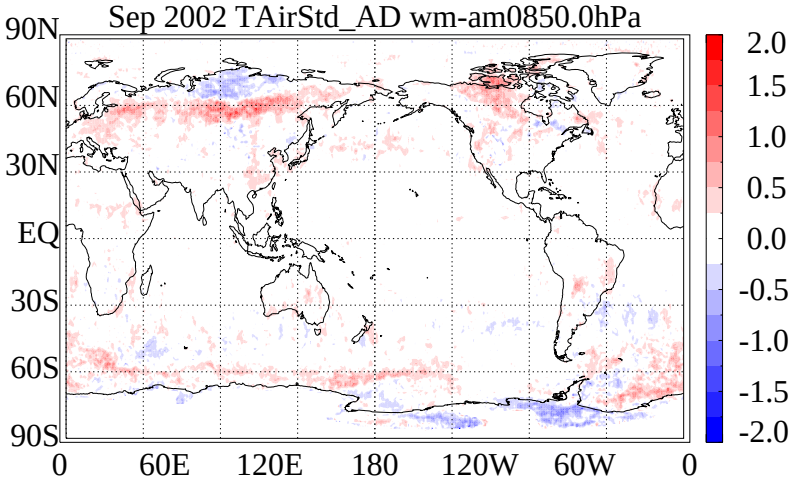
# MERRA Sampled Like AIRS

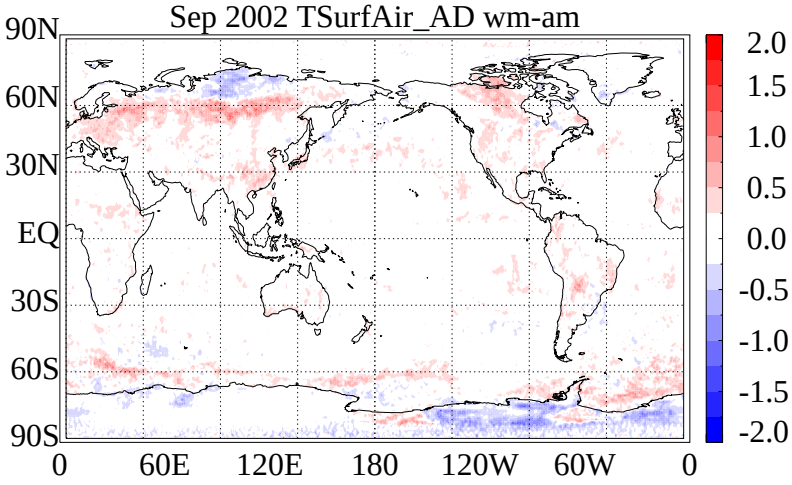



The valid data tends to be warmer according to MERRA. Giving those observations more weight might increase the sampling bias.

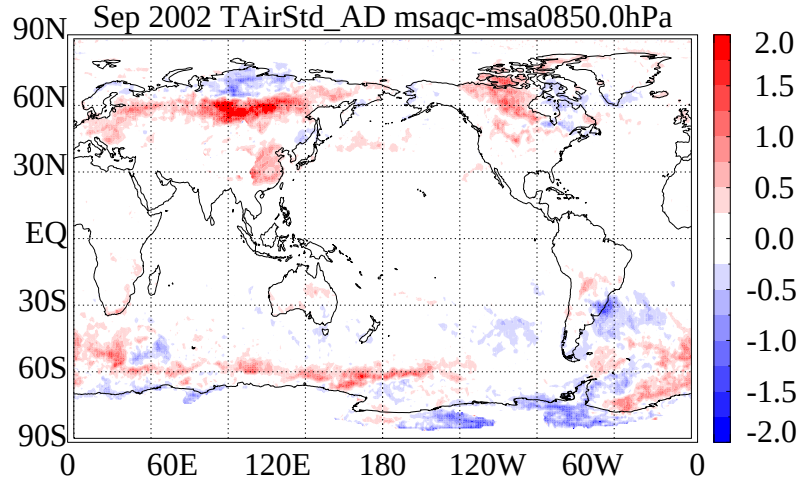
# Weighting and Rejecting

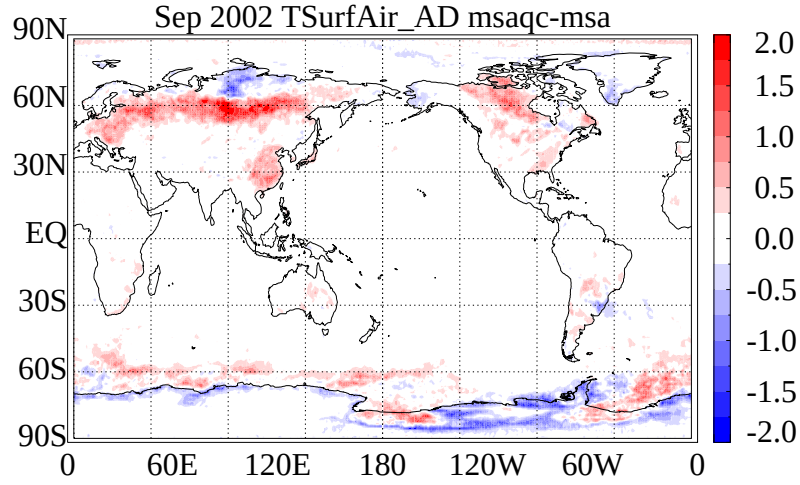
## Arithmetic Mean - Wt Mean




## MSAQC-MSA



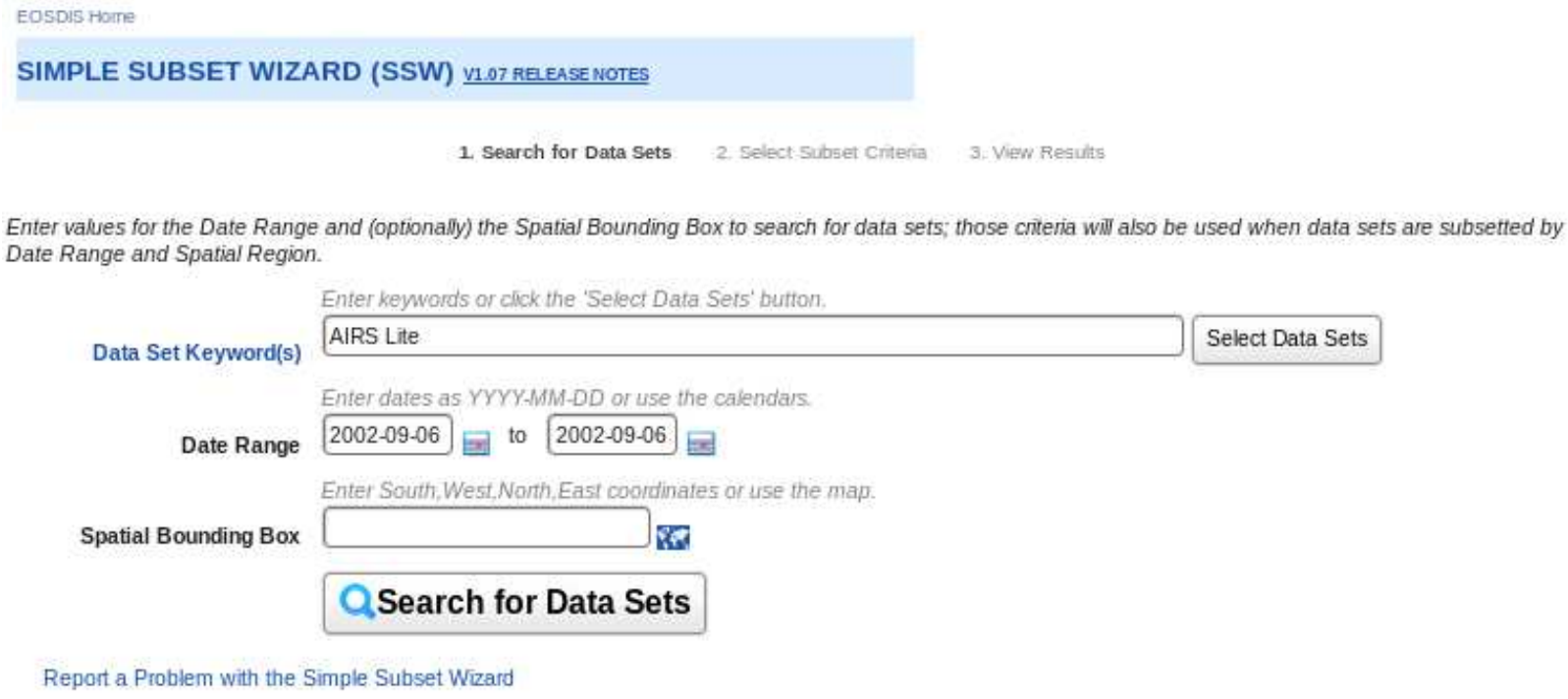



# L3 Lite

| File Type | Number of Variables | Size (Megabytes) |
|---|---|---|
| Version 5 AIRX3STD 2002.09.06 (hdf-eos) | 268 | 76 |
| Version 6 AIRX3STD 2002.09.06 (hdf-eos) | 785 | 400 |
| “Level 3 Lite” Just mean and counts for the A and D grids (netcdf3 or ascii) | $\leq$ 132 | $\leq$ 165 (53 compressed) |

# L3 Lite

http://disc.gsfc.nasa.gov/SSW



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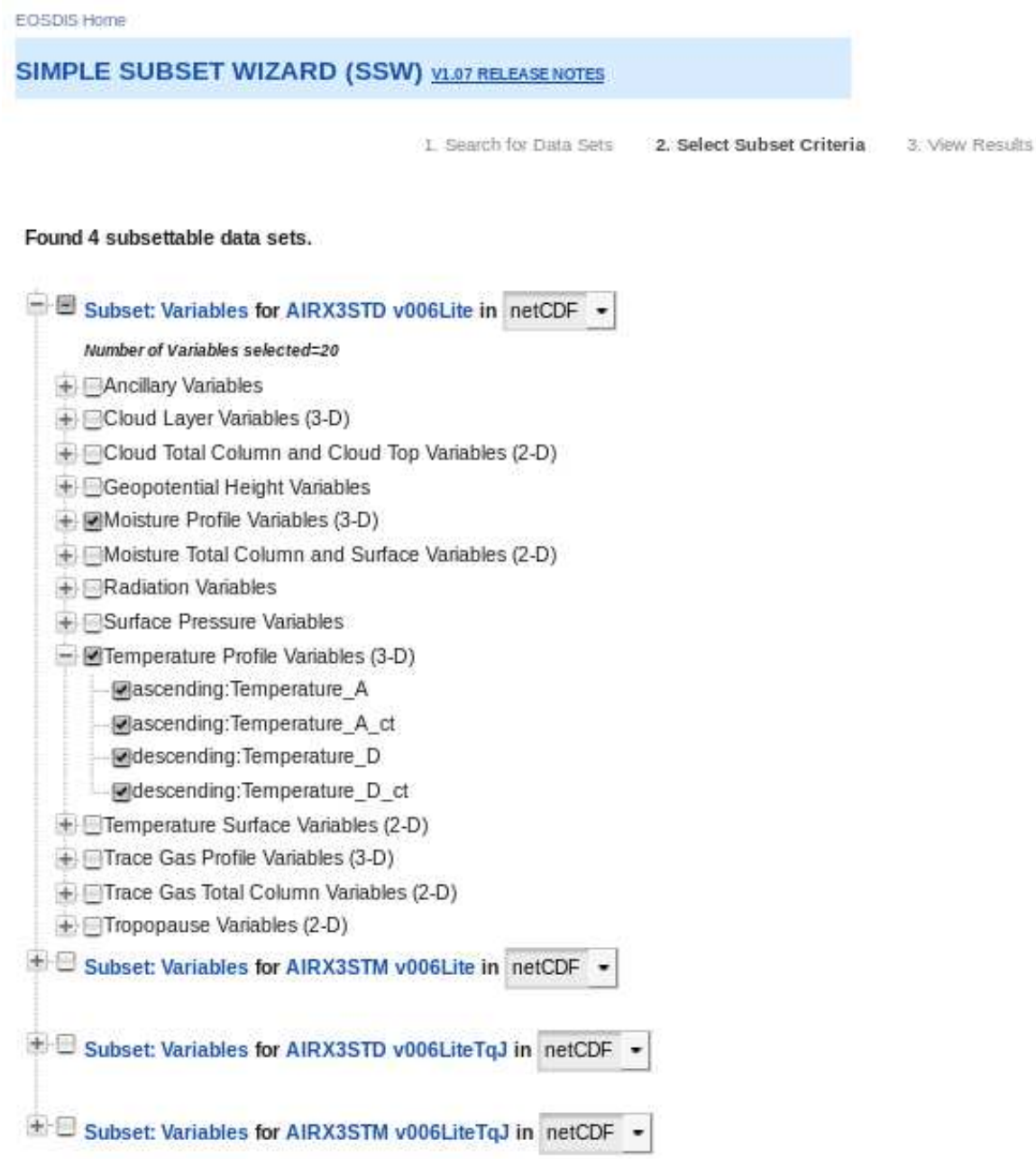

# Conclusions

- Use the “Feedback” button on Giovanni-4 or ask me to request additional variables or plot types.
- PGE is capable of running in “climatology mode” but some sampling issues should be considered first.
- The bias due to weighting is just a small part of the sampling bias.
- G4 will likely get another unofficial climatology.
- In the mean time users may want to download the “L3 Lite” product to make their own monthly climatologies.